

TABLE 17.—Mean wind movement (miles per hour).

| Stations. | Length of record (years). | January. | February. | March. | April. | May. | June. | July. | August. | September. | October. | November. | December. | Annual. |
|---------------|---------------------------|----------|-----------|--------|--------|------|-------|-------|---------|------------|----------|-----------|-----------|---------|
| San Jose..... | 3 | 11.1 | 12.4 | 10.1 | 9.8 | 5.3 | 4.4 | 5.3 | 4.7 | 4.4 | 4.1 | 6.6 | 8.2 | 7.2 |
| Ancon..... | 8 | 8.9 | 9.6 | 10.4 | 8.6 | 6.2 | 5.8 | 8.9 | 6.3 | 6.0 | 6.4 | 6.3 | 7.9 | 7.4 |
| Culebra..... | 5 | 8.4 | 9.3 | 9.8 | 9.1 | 6.0 | 5.0 | 6.4 | 5.8 | 5.3 | 4.9 | 6.1 | 7.2 | 7.0 |
| Colon..... | 6 | 13.6 | 14.9 | 15.0 | 13.4 | 7.8 | 6.6 | 8.5 | 7.8 | 6.9 | 7.0 | 8.8 | 11.3 | 10.1 |

TABLE 18.—Maximum wind velocity (miles per hour).

| Stations. | Length of record (years). | January. | February. | March. | April. | May. | June. |
|--------------|---------------------------|----------|-----------|----------|---------|---------|---------|
| Ancon..... | 8 | 28, n.w. | 29, n.w. | 30, n.w. | 26, n. | 27, se. | 34, s. |
| Culebra..... | 7 | 30, n. | 33, n. | 35, n. | 31, n. | 28, ne. | 31, s. |
| Colon..... | 6 | 32, n. | 36, ne. | 36, ne. | 33, ne. | 36, n. | 33, se. |

| Stations. | July. | August. | September. | October. | November. | December. | Annual. |
|--------------|--------|---------|------------|----------|-----------|-----------|---------|
| Ancon..... | 59, s. | 31, ne. | 31, ne. | 38, se. | 26, se. | 24, n.w. | 59, s. |
| Culebra..... | 39, n. | 40, ne. | 32, ne. | 35, s. | 40, ne. | 27, ne. | 40, ne. |
| Colon..... | 40, s. | 30, s. | 37, w. | 38, sw. | 39, sw. | 38, n. | 40, s. |

NOTES, ABSTRACTS, AND REVIEWS.

HAWAIIAN RAINFALL STATISTICS FOR 1922.¹

From the published rainfall statistics for Hawaii, 1922, we cull the following interesting information:

The rainfall during the first three months of the year was considerably in excess of the normal; then followed five successive months of deficient rains and the year closed with rainfall about 9 inches below the normal.

The greatest recorded catch, 452.00 inches, was on the summit of Mount Waialeale, Kauai, elevation 5,075 feet ² and the least 3.18 inches at Olowalu, elevation 10 feet on the leeward shore of Maui. Other points where a catch of more than 300 inches was recorded are, Puu Kukui (upper) Maui, altitude 5,000 feet 346 inches, 103 inches of which is said to have fallen in the single month of January. The catch at Waiakamoi Gulch, Maui, altitude 4,250 ft. was 342.64 inches, which fell in 217 days, or an average of 1.5 inches per day. The rainfall of the Hawaiian Group is almost wholly orographic.

It is only when the northeast trades temporarily weaken or suspend, as happens in the case of the passage of barometric troughs (kona storms), that rain of any consequence falls on the leeward slopes of the islands and this is the explanation of the very small amount registered at Olowalu, as above.—A. J. H.

CONCERNING THE ORIGIN AND DISAPPEARANCE OF SURFACES OF DISCONTINUITY IN THE ATMOSPHERE.

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The investigations which have been carried on in the mountains of Sweden have revealed several types of

BIBLIOGRAPHY.

On account of the length of the list of references scattered through the works consulted no notations are given in text and tables. These reference works include the following:

- Harrington, Mark W. Central American Rainfall, Philosophical Society of Washington, Bulletin, Vol. XIII.
 Merz, Alfred. Beiträge zur Klimatologie und Hydrographie Mittelamerikas.
 Willson, F. D. The Climatology and Hydrology of the Panama Canal.
 Davis, A. P. Hydrography of the American Isthmus.
 Greely, A. W. The Nicaragua Canal in its Military Aspects.
 Lottermoser, Eckhard. Die Regenverhältnisse Mittelamerikas mit besonderer Berücksichtigung von Salvador und Süd-Guatemala.
 Lottermoser, Eckhard. Die Ergebnisse der Temperatur-Beobachtungen in Salvador und Süd-Guatemala.
 Hann, Julius. Handbuch der Klimatologie, 1903.
Meteorologische Zeitschrift. [Various issues vols. 8-38, inclusive.]
 Anales del observatorio nacional meteorológico de San Salvador. [Various issues.]
Boletín del Instituto físico-geográfico de Costa Rica. [Various issues.]
Report of the Nicaragua Canal Commission, 1897-1899.
Summary of Meteorological Observations at Belize (St. Joseph's Observatory). [Various issues.]
 Report of the Governor of the Panama Canal.

surface of discontinuity, some of which are very obvious and of practical importance, and some of which are easily overlooked. As an example of the former, the clear region bordering the coast which is much utilized by coastwise sailors, is due to the meeting of cold, heavy easterly air with warm, westerly air. The westerly air is under-run by the easterly and an ever-thickening cloud layer is formed which eventually reaches the surface of the sea as a fog bank with an almost vertical front. Other, less-marked, discontinuities occur above valleys in which air has been cooled by radiation and another current of air flows over the top of the valley air. Vague discontinuities occur at the upper surface of a layer of warm surface air in a convective region. After sufficient warm air has accumulated, the ascending column gives rise to very sharp discontinuities between itself and the surrounding atmosphere.

The author has conducted researches relative to the temperature distribution in water under quiet conditions and also when surfaces of discontinuity were formed. The results of these investigations, and also of his meteorological observations, indicate that the relative speed of the two adjacent streams and not the difference in temperature alone determines the degree of sharpness of the surface.

Owing to its geographical situation, Sweden becomes the meeting-ground, in winter, of sharp contrasts in temperature between continental air to the east and oceanic air to the west. With moving cyclones in which these masses of air are converted into rapidly moving streams there frequently appear upon the weather map the phenomena which Bjerknes has related to the Polar Front. But between such moving cyclones, the wind speed is diminished and often it is impossible to trace the surface of discontinuity. Thus, the author

¹ Climatological Data, Hawaii Section, Annual Summary 1922. Thomas R. Blair, Meteorologist.

² Cf. MO. WEA. REV. 47: 305-308.